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Coast Guard and Maritime
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COAST GUARD ACQUISITIONS

Enhanced Oversight of Testing Could Benefit National Security Cutter Program and Future DHS Acquisitions

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GAO Highlights

Highlights of [GAO-16-314T](#), a testimony before the Subcommittee on Coast Guard and Maritime Transportation, Committee on Transportation and Infrastructure, House of Representatives

Why GAO Did This Study

The Coast Guard's flagship, 418-foot NSC was first commissioned in 2008. It completed initial testing, an event designed to test all critical systems that are necessary for successful operations, in the spring of 2014, after 7 of the 8 planned cutters were already under contract and 3 ships were operational. GAO has been reviewing the NSC as part of its broader Coast Guard acquisition reviews since 2001.

This statement is primarily based on GAO's January 2016 report on the NSC's initial testing event ([GAO-16-148](#)), and addresses issues related to (1) the results of the NSC's initial test event, (2) the Coast Guard's plans for follow-on testing, and (3) the performance of the NSC during operations. The statement also includes GAO's observations on the Coast Guard's acquisition approach for its Fast Response Cutter and Offshore Patrol Cutter programs. GAO reviewed these two programs in June 2014 ([GAO-14-450](#)) and April 2015 ([GAO-15-171SP](#)) and also conducted selected updates on their acquisition status in January 2016. The statement also draws on GAO's prior work on commercial shipbuilding best practices.

What GAO Recommends

In January 2016 ([GAO-16-148](#)), GAO recommended that DHS take several actions to strengthen oversight of test and evaluation of major assets. GAO also recommended that the Coast Guard direct the NSC program to clarify the key performance parameters for cutter boat operations. DHS and the Coast Guard concurred with all of these recommendations.

View [GAO-16-314T](#). For more information, contact Michele Mackin at (202) 512-4841 or mackinm@gao.gov.

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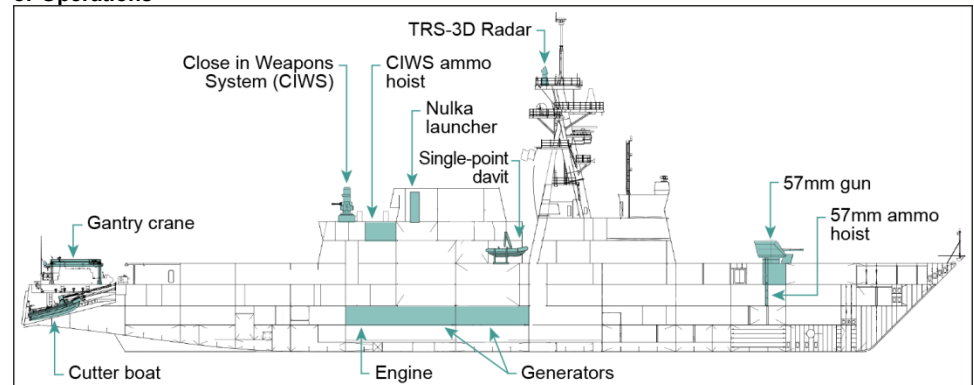
What GAO Found

In January 2016, GAO reported that the Navy's Commander, Operational Test and Evaluation Force conducted the initial testing on the National Security Cutter (NSC) in spring 2014, when three of the cutters were already operational. The Navy deemed the NSC operationally effective and suitable. At the same time however, the testing revealed some major deficiencies. Two metrics used to assess an asset in testing are key performance parameters (KPP) and critical operational issues (COI). The NSC met 18 of 19 COIs and 12 of its 19 KPPs. Navy testers found 10 major deficiencies that varied in terms of their effect on the NSC program, including 4 deficiencies related to the NSC's weapon systems and 1 for its cutter boats. The Coast Guard plans to correct most of the NSC's major deficiencies.

Also, as GAO reported, following initial testing, a Department of Homeland Security (DHS) acquisition review board approved the NSC program for full rate production in October 2014. The Coast Guard plans to begin follow-on testing in fall 2016. DHS acquisition guidance does not specify the timing of follow-on testing for its programs or any actions program offices should take in response to the findings of follow-on testing. As a result, future DHS acquisitions risk fielding assets without knowing the full capabilities, as was the case with the NSC.

GAO also found that problems discovered outside of testing are preventing the Coast Guard from operating fully capable NSCs. By the time of initial testing, the Coast Guard had nearly 4 years' experience operating NSCs and has encountered issues that require retrofits. In order to minimize cost increases for some changes, the Coast Guard plans to maintain the original equipment for the production of the remaining NSCs and conduct retrofits after accepting delivery. In some instances, replacement equipment is still in the prototype phase. The identified problems will continue to affect the NSC until retrofits are implemented.

Examples of National Security Cutter Equipment That Have Encountered Problems in Testing or Operations



Source: GAO presentation and analysis of U.S. Coast Guard data. | [GAO-16-314T](#)

GAO has observed, based on prior work reviewing the Coast Guard's ongoing Fast Response Cutter program and plans for its upcoming Offshore Patrol Cutter program, that the Coast Guard has matured its acquisition process. The process to date reflects some lessons learned from the NSC acquisition, for example in the

areas of competition and the schedule for initial testing. Furthermore, as the \$12 billion Offshore Patrol Cutter program moves forward, it may have opportunities to further incorporate some best practices that GAO has highlighted in May 2009 ([GAO-09-322](#)) and March 2013 ([GAO-13-325](#)) on other shipbuilding work. For example, before a contract is signed, best practices call for a full understanding of the effort needed to design and construct the ship to be reached, enabling commercial buyers and shipbuilders to sign a contract that fixes the price, delivery date, and ship performance parameters.

Chairman Hunter, Ranking Member Garamendi, and Members of the Subcommittee:

I am pleased to be here today to discuss the status of the Coast Guard's National Security Cutter (NSC) program, in particular its initial test results and operational effectiveness. The flagship, 418-foot NSC was first commissioned in 2008, and completed initial operational test and evaluation (IOT&E), an event designed to test all critical systems that are necessary for successful operations, in the spring of 2014, after 7 of the 8 cutters were under contract.¹ We have been reviewing the NSC as part of our broader Coast Guard acquisition reviews since 2001.

My statement today is based on our January 2016 report on the NSC's IOT&E event.² I will address issues related to (1) the results of the NSC's IOT&E, (2) the Coast Guard's plans for follow-on operational test and evaluation (FOT&E), and (3) the performance of the NSC during operations. I will also offer observations on the acquisition approach of the Coast Guard's Fast Response Cutter (FRC) that is currently being deployed and the planned Offshore Patrol Cutter (OPC). The FRC replaces the Coast Guard's Island Class Patrol boat, and provides greater fuel capacity and improved communications capabilities over the legacy asset, as well as the ability to conduct full operations in moderate sea conditions. The OPC is intended to replace the Coast Guard's aging Medium Endurance Cutter fleet and is to be the backbone of the cutter fleet for the foreseeable future. We most recently reviewed the FRC and OPC as part of our June 2014 report on Coast Guard acquisitions, which was work requested by this committee, and our April 2015 report on the Department of Homeland Security's (DHS) major acquisitions.³

¹Although the Coast Guard has planned for 8 NSCs, the Consolidated Appropriations Act, 2016 stated that, of the funds provided by the Act, not less than \$640 million shall be immediately available and allotted to contract for the production of the ninth NSC, notwithstanding the availability of funds for post-production costs. Pub. L. No. 114-113 (Dec. 18, 2015).

²GAO, *National Security Cutter: Enhanced Oversight Needed to Ensure Problems Discovered during Testing and Operations Are Addressed*, [GAO-16-148](#) (Washington, D.C.: Jan. 12, 2016).

³GAO, *Coast Guard Acquisitions: Better Information on Performance and Funding Needed to Address Shortfalls*, [GAO-14-450](#) (Washington, D.C.: June 5, 2014) and GAO, *Homeland Security Acquisitions: Major Program Assessments Reveal Actions Needed to Improve Accountability*, [GAO-15-171SP](#) (Washington, D.C.: April 22, 2015).

Based on findings from our January 2016 report, we recommended that DHS take several actions to strengthen oversight of test and evaluation of major assets. We also recommended that the Coast Guard direct the NSC program to clarify the key performance parameters (KPP) for cutter boat operations. DHS and the Coast Guard concurred with all of our recommendations.

For our January 2016 report, we reviewed the NSC's program documentation, including test reports, and key metrics the Coast Guard uses to evaluate assets. We interviewed Coast Guard officials and officials from the Navy's Commander, Operational Test and Evaluation Force (COTF)—which conducted the NSC testing—to determine areas where the NSC is or is not meeting required capabilities and performance metrics. To add important context to our review, we toured the NSC used for IOT&E (*Stratton*) and interviewed the Commanding Officer concerning his experiences operating the vessel and its capabilities. To assess the Coast Guard's plans for FOT&E, we reviewed Coast Guard and DHS guidance and Coast Guard documents. We interviewed Coast Guard officials to determine the timeline for FOT&E, identify what systems will be tested, and determine what, if any, changes are planned for the NSC fleet based on IOT&E and operations. To assess the performance of the NSC during regular operations, we reviewed after action reports and engineering reports, which are prepared by the cutters' commanding officers, to identify any equipment casualties (i.e., equipment failures) the cutters are experiencing on a regular basis and the effect that these casualties are having on operations. We also toured the Huntington Ingalls Industry shipyard in Pascagoula, Mississippi, where the NSCs are built to gain an understanding of how design changes are incorporated into the production process. For our April 2015 review that included the OPC and FRC, we reviewed the programs' schedules, cost estimates, and acquisition plans and interviewed program officials. For our June 2014 report, we reviewed the acquisition program baseline for programs in the Coast Guard's portfolio as well as the Coast Guard's budget and discussed the acquisition portfolio with Coast Guard, DHS, and Office of Management and Budget officials and followed up on previous efforts to address affordability. This statement also draws from our prior work on commercial best practices in shipbuilding.⁴ More information about the

⁴GAO, *Best Practices: High Levels of Knowledge at Key Points Differentiate Commercial Shipbuilding from Navy Shipbuilding*, [GAO-09-322](#) (Washington, D.C.: May 13, 2009).

scope and methodology of this past work can be found in these reports. We also obtained updated information from the Coast Guard on the acquisition status of the FRC and OPC, which we incorporated as appropriate throughout the statement, and shared with Coast Guard officials our observations on the FRC and planned OPC acquisition approaches.

We conducted the work on which this statement is based in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

DHS and Coast Guard acquisition guidelines require operational test and evaluation by an independent test agency to confirm that the production configured system meet all requirements before approval for full-rate production. The Coast Guard uses the U.S. Navy's COTF to conduct operational tests and other evaluations for its major acquisition programs according to those programs' requirements. COTF serves as an independent evaluator of an asset's capabilities and has experience testing U.S. Navy assets.

In conducting operational testing, COTF evaluates an asset's operational effectiveness and suitability:

- For operational effectiveness, testers determine whether or not an asset can meet its missions.
- For operational suitability, testers determine whether or not the agency can logistically support the asset to an acceptable standard, such as having the asset available for operations 85 percent of its scheduled deployment time.

Critical operational issues (COI) are one metric used to determine an asset's operational effectiveness and suitability and are stated in the form of a question. COIs are examined during testing to evaluate a system's ability to provide the desired capability and perform its mission. COTF assessed the NSC's COIs, for example, by comparing the outcome of the test event against the full scope of the COI to determine whether the COI was met or not. Unmet COIs are often the result of related deficiencies,

which are identified during testing and include any system that is lacking in its ability to meet normal standards or to function as intended. Deficiencies are scored based on the severity of the problem and its impact on the asset's ability to accomplish its mission.⁵ COIs and deficiencies identified during testing both factor into an asset's overall operational effectiveness and suitability rating.

In addition to verifying that an asset is operationally effective and suitable, operational testing also tests key performance parameters (KPP), which are the capabilities considered essential for mission accomplishment. KPPs are listed by threshold values, which are the minimum acceptable level of performance, and objective values, which are the desired level of performance. For example, a KPP for the NSC is being able to reach a maximum speed of 28 knots for a threshold value and 31 knots for an objective value. KPPs differ from COIs in that KPPs focus on specific performance metrics, while COIs focus on certain types of missions that an asset should be able to conduct or an asset's ability to be ready to perform those missions. Table 1 provides examples of COIs and KPPs for the NSC.

Table 1: Examples of National Security Cutter Critical Operational Issues and Key Performance Parameters

Critical Operational Issue	Key Performance Parameter
Defense Readiness – Will the NSC be capable of providing defense readiness to a combatant commander?	Deliver warning shots
Surveillance and Reconnaissance – Will the NSC effectively conduct the mission of surveillance and reconnaissance?	Exchange information with mission partners
Reliability – Will the reliability of the NSC support completion of its mission?	Endurance – 60 days without replenishment for fuel and subsistence.

Source: GAO presentation of Coast Guard information. | GAO-16-314T

⁵ Deficiencies are rated as Severe (precludes mission accomplishment), Major 1 (critical impact on mission accomplishment), Major 2 (serious impact on mission accomplishment), Major 3 (moderate impact on mission accomplishment), and Minor (no significant impact on mission accomplishment).

Operational testing can occur over many test events. Two of those key test events are:

- Initial Operational Test and Evaluation (IOT&E): This event is meant to gather the data necessary to resolve COIs, determine an asset's operational effectiveness and suitability, and, according to Coast Guard acquisition guidance, occur prior to a full-rate production decision. The test event concludes with a rating of operationally effective or not effective, operationally suitable or not suitable.
- Follow-on operational test and evaluation (FOT&E): This event is conducted after IOT&E and an asset's full rate production decision and focuses on refining the conclusions that were made during previous operational test events, evaluating production changes, and reevaluating the system to ensure that it continues to meet operational needs. It also validates any incomplete or deferred requirements and verifies the correction of deficiencies identified during IOT&E. FOT&E concludes with an operational effectiveness and suitability rating similar to that of IOT&E.

Following IOT&E and FOT&E, COTF writes a test report that focuses on the resolution of the asset's COIs and any deficiencies that were identified during testing. These reports typically include a summary of the resolution of the asset's COIs.

While Initial Operational Testing Revealed Some Major Deficiencies, the NSC Met Most of Its Key Performance Parameters

As we reported in January 2016, IOT&E took place about 2 years later than planned and after 7 of the 8 planned NSCs were under contract, with 3 operational.⁶ We have previously found that delaying critical test events can lead to late discoveries and could result in additional design changes and costs to programs.⁷ The 8 NSCs are planned to be fully operational by 2020 and the Coast Guard is phasing out the legacy 378-foot High Endurance Cutters as the NSCs enter operations. During testing, the NSC successfully demonstrated 18 of its 19 COIs, with one COI—cybersecurity—being deferred to FOT&E. This deferral was due to the DHS Director of Operational Test and Evaluation (DOT&E) postponing the testing of the NSC’s cybersecurity capabilities until a more robust test plan could be developed to reflect emerging threats.

At the conclusion of IOT&E, COTF found the NSC to be operationally effective and suitable, but with 10 major deficiencies. None of the major deficiencies were rated as severe, which would preclude the NSC from accomplishing its mission. Five of the 10 major deficiencies pertained to the NSC’s weapon systems and cutter boats. Table 2 shows the 10 deficiencies.

Table 2: National Security Cutter Major Deficiencies Identified during Initial Operational Test and Evaluation

Initial Operational Test and Evaluation (IOT&E) deficiency rating	System	Deficiency discussion
Major 1 – Critical impact on mission accomplishment	Close-in weapon system (CIWS) – Part of the combat system, a radar-guided gun used to protect against Anti-ship Cruise Missiles and close-in surface and low flying aircraft.	CIWS suffered an equipment failure that resulted in a loss of capability.
Major 2 – Serious impact on mission accomplishment	NULKA Launcher – Part of the combat system, it provides defense against modern radar homing anti-ship missiles by using a rocket-propelled, disposable decoy to lure the missiles away from the NSC.	One of the NSC’s two NULKA launchers was inoperable during IOT&E, and was not repaired prior to completing the test event.

⁶[GAO-16-148](#).
⁷GAO, *Navy Shipbuilding: Significant Investments in the Littoral Combat Ship Continue Amid Substantial Unknowns About Capabilities, Use and Cost*, [GAO-13-530](#) (Washington, D.C.: July 22, 2013).

Initial Operational Test and Evaluation (IOT&E) deficiency rating	System	Deficiency discussion
Major 2	TRS-3D Air Search Radar – Part of the combat system, it detects targets of interest and allows the NSC to clear the airspace around the cutter for safe helicopter operations.	The air search radar suffered an equipment failure that resulted in a loss of capability.
Major 3 – Moderate impact on mission accomplishment	Access to electronic racks – The racks are located in the Combat Information Center and contain different information systems used for communications.	Technicians had no direct access to maintenance and test ports which required disabling some critical communication equipment in order to gain access. This results in temporary degraded capability to maintain command and control during assigned missions.
Major 3	Cutter boat operational parameters – The NSC is intended to operate three cutter boats, two Over the Horizon-IVs (OTH-IV) and one Long Range Interceptor Mark II (LRI-II). The LRI-II was not tested during IOT&E.	The cutter boat is not designed to operate in all of sea state 5. However, the NSC routinely operates in areas that experience sea state 5 and above; having a cutter boat with different operational limitations could in some instances result in degraded capability if the situation warranted use of a cutter boat to enhance a certain specific mission. ^a
Major 3	Common Operational Picture (COP) display – An information display that provides the position and additional information of vessel and aircraft contacts to the Coast Guard and other decision makers.	During 57mm live fire events, the COP suffered an equipment failure that resulted in a loss of capability.
Major 3	Remote operated valves – Designed as a manning reduction measure to reduce the number of personnel required to operate the damage control systems.	During testing, the crew was unable to remotely operate damage control valves. This situation degrades the capability of the cutter by inhibiting timely response and increasing the number of crew required to operate fire pumps and fuel transfer valves.
Major 3	57mm gun weapon system – An intermediate caliber weapon that fires high-explosive rounds, which can be employed against large and small surface craft as well as low-slow flier air threats.	The 57mm gun suffered a misfire that disrupted the test event.
Major 3	Command and Control (C2) embedded training module – The C2 system is required to have the capability to train, sustain, and enhance individual and crew skill proficiencies necessary to operate and maintain the asset.	There was not an available embedded training module within the C2 system to simulate air and surface contacts. This prevented realistic tactical drills and exercises.
Major 3	Rubber electric matting installation – Used to protect crew and equipment from electrical shock hazards.	The gaps in the electrical safety matting were too large, exposing crew and equipment to the metal deck below. The improper installation of the matting presented an electrical shock hazard to personnel and installed equipment.

Source: GAO presentation of Navy and Coast Guard data. | GAO-16-314T

Note: Shaded rows are deficiencies that were known prior to IOT&E, but not repaired.

^aSea state refers to the height, period, and character of waves on the surface of a large body of water.

In its assessment of the NSC's IOT&E event, DOT&E stated that the reliability and operational availability issues of the weapon systems—the CIWS, NULKA Launcher, TRS-3D air search radar, and the 57-mm gun—affect the overall ability of the NSC to conduct certain missions. While the CIWS, NULKA launcher, and air search radar were all repaired following IOT&E, post-operational reports indicate that problems persist with these systems as they were often unavailable during operations.⁸ Despite these findings, as noted above, COTF found the NSC to be operationally effective and suitable.

While COIs and deficiencies factor into a system's operational effectiveness and suitability rating, KPPs are measures of the capabilities considered essential to mission accomplishment. In our January 2016 report, we found that during IOT&E and other test events, the NSC fully met 12 of its 19 KPPs.⁹ However, by not meeting all KPPs, the Coast Guard is not able to demonstrate that the NSC is providing the capabilities that it intended to field. For instance, the Coast Guard has not yet demonstrated that the NSC can achieve a hard and soft kill against a subsonic cruise missile as required, or fully meet interoperability requirements with the Department of Defense, DHS, and other government agencies.¹⁰ Table 3 displays the 7 KPPs not fully met for the NSC, the test results, and a discussion of these results.

⁸ Post-operational reports include engineering reports and after action reports. Engineering reports are annual reports that address the high priority engineering and sustainability problems with the cutter's equipment and provide an assessment of the condition of the cutter, among other things. After action reports are command-approved reports that provide detailed observations about cutter operations, casualties, and lessons learned, among other things, following deployments.

⁹ By comparison, the Maritime Patrol Aircraft conducted IOT&E in July 2012 and it met or partially met 4 of its 7 KPPs. The Fast Response Cutter conducted IOT&E in July 2013 and it partially met only 1 of its 6 KPPs.

¹⁰ Hard kill involves an active attempt to destroy a missile, such as using the CIWS to destroy the target. Soft kill involves using a decoy, such as the NULKA, to lure missiles away from the target.

Table 3: Key Performance Parameters Not Fully Met for the National Security Cutter

Key performance parameter (KPP) (threshold requirement)	Was KPP tested?	Was KPP met?	Test result	Discussion
Transit range (12,000 nm)	Yes	Partial	10,967 nm	Insufficient data was collected during Initial Operational Test and Evaluation (IOT&E) to resolve the KPP. NSC 1 and 2 have met the threshold in operations and NSCs 3 through 8 will be tested in the future.
Conduct all missions (sea state 5: up to 13.1 foot waves) ^a	Yes	Partial	The cutter boats are not rated to operate in all of sea state 5.	The operational limitation of the embarked cutter boat during IOT&E was mid sea state 5 (11 foot waves).
Ability to embark, launch and recover a cutter boat (sea state 5: up to 13.1 foot waves)	Yes	Partial	The cutter boats are not rated to operate in all of sea state 5.	The operational limitations of the embarked cutter boat during IOT&E was mid sea state 5 (11 feet).
Ability to embark, launch and recover a cutter boat while towing	Yes	Partial	The NSC demonstrated that it can tow a vessel of similar size.	For the NSC to conduct towing operations, one of the rear cutter boats has to be launched, which will be problematic in higher sea states since the cutter boat is not rated for operations in seas higher than mid sea state 5 (11 feet).
Conduct a minimum of 4 hours of flight operations day and night with manned aircraft and 16 hours with a combination of manned and unmanned aircraft systems (UAS)	Partial	Partial	The manned system requirements were met. The UAS has not been fielded or tested yet.	According to Coast Guard officials, of the 20 UAS programs reviewed, only 2 came close to meeting the requirements. Not having UAS has reduced the aerial surveillance capability of the NSC. NSC operators explained that the cutters regularly deploy with one helicopter.
Achieve hard and soft kill against a subsonic anti-ship cruise missile	No	No	N/A	According to DHS officials, the target drone was not available for IOT&E due to a moratorium on using the target for tests that resulted from a malfunction during a U.S. Navy test using the same target.
Interoperability (exchange information with mission partners)	Yes	Partial	Not all information systems were installed prior to IOT&E, which was cited as a limitation to the test.	According to Coast Guard officials, Link-11, a system used to transmit and receive information with U.S. Navy ships, was only able to receive data. A pending upgrade to the NSC's C4ISR software should allow the cutter to transmit data.

Source: GAO analysis of Navy and Coast Guard data. | GAO-16-314T

^aSea state refers to the height, period, and character of waves on the surface of a large body of water.

Of the 7 KPPs not met, 3 pertain to the NSC's cutter boat operations. The cutter boats are designed to be integral to the NSC's overall capability, operate both within and beyond the visual range of the NSC, and enhance the overall mission effectiveness of the NSC in every mandated

mission area.¹¹ We found that the Coast Guard and COTF have different interpretations of the cutter boat KPPs. COTF conducted IOT&E according to the NSC's test and evaluation plan and determined that the three KPPs involving cutter boats were not fully met since the boats are unable to operate through all sea state 5 conditions. According to Coast Guard officials, the September 2012 requirements document for the NSC should have been written more clearly to convey the sea state expectation for cutter boat launch and recovery operations, since the NSC's sea state KPP was never intended to be applicable to the operation of the cutter boats. In January 2016 we recommended, and the Coast Guard concurred, that the NSC's KPPs for the operation of the cutter boats should be clarified.

Unclear Guidance on Follow-on Testing May Lead to NSCs and Future DHS Assets Deploying without Having Demonstrated Full Capabilities

As we reported in January 2016, according to COTF officials, FOT&E will begin in the fall of 2016 and is scheduled to continue through at least 2017. Following IOT&E, DHS held an acquisition review board (ARB) to discuss the outcome of IOT&E, which resulted in DHS approving the NSC program for full rate production in October 2014. ARBs review major acquisition programs for proper management, oversight, accountability, and alignment with DHS's strategic functions at acquisition decision events and other meetings as needed. The resulting acquisition decision memorandum (ADM) from October 2014 directed the Coast Guard to conduct FOT&E and complete three action items: (1) complete testing of the cybersecurity COI; (2) verify the correction of all major deficiencies, including the unmet KPPs; and (3) assess the NSC's cyber-security capabilities. The cybersecurity COI is planned to be tested in 2016, which, if successful, will address the first and third requirements of the ADM, but other testing events are expected to occur through 2017 and possibly beyond.

The ADM also directed the Coast Guard to verify the correction of all deficiencies, including the 7 unmet KPPs. According to Coast Guard officials, they have corrected 4 of the 10 major deficiencies from IOT&E that involved equipment failures by restoring the operational status of the

¹¹The NSC is intended to deploy with three cutter boats: two Over The Horizon-IV (OTH-IV) and one Long-Range Interceptor II (LRI-II). The OTH-IV is a 26-foot boat capable of over-the-horizon operations with a range of 200 nautical miles and is capable of achieving speeds of 40 knots. The LRI-II is 35 feet long with a range of more than 200 nautical miles and is capable of sustaining speeds of 38 knots.

related systems on the *Stratton*, and they have plans to correct four more. However, according to Coast Guard documentation and officials, they may not correct 2 deficiencies due to the cost of making fleet-wide changes, and because the Coast Guard has developed an interim solution. Table 4 shows the Coast Guard's plans, as we reported in January 2016, for resolving the major deficiencies.

Table 4: Coast Guard Plans to Resolve Initial Operational Test and Evaluation Major Deficiencies

Initial Operational Test and Evaluation deficiency rating	Plan to resolve through Follow-on Operational Test and Evaluation	Deficiency Status
Major 1 – Close-in-weapon system	The Coast Guard has corrected this deficiency and plans to work with the Commander Operational Test and Evaluation Force (COTF) to close-out this deficiency during the third quarter of fiscal year 2016.	Addressed by Coast Guard; pending close-out with COTF
Major 2 – NULKA Launcher	The Coast Guard has corrected this deficiency and plans to work with COTF to close-out this deficiency during the third quarter of fiscal year 2016.	Addressed by Coast Guard; pending close-out with COTF
Major 2 – TRS-3D Air Search Radar	The Coast Guard has corrected this deficiency and plans to work with COTF to close-out this deficiency during the third quarter of fiscal year 2016.	Addressed by Coast Guard; pending close-out with COTF
Major 3 – Access to electronic racks	The Coast Guard is considering alternate configurations of the racks to mitigate access challenges. However, the cost of implementing alternate configurations may make fleet-wide changes an unrealistic option.	No immediate plans
Major 3 – Cutter boat operational parameters	According to Coast Guard officials, a cutter boat safe operating limits study, being conducted in conjunction with the U.S. Navy, is expected to be complete by September 2016. Its results will inform discussions with COTF regarding cutter boat safe operational parameters.	Pending
Major 3 – Common Operational Picture	Problems with the information display were observed again during the <i>Waesche's</i> August 2015 Combat System Ship Qualification Trials (CSSQT) and the Coast Guard plans to reconfigure the mounts and retest.	Pending
Major 3 – Remote operated valves	The Coast Guard has developed an interim solution by operating the valves manually, which Coast Guard officials have indicated is a lower priority deficiency to address.	No immediate plans
Major 3 – 57mm gun weapon system	The Coast Guard has corrected this deficiency and plans to work with COTF to close-out this deficiency during the third quarter of fiscal year 2016.	Addressed by Coast Guard; pending close-out with COTF
Major 3 – Command and control	The Coast Guard is completing the design of an upgrade for embedded training and expects to install the upgrade starting in fiscal year 2016. All cutters are expected to receive the upgrade.	Pending
Major 3 – Rubber electric matting installation	The same installation error was observed on the <i>Waesche</i> during its August 2015 CSSQT and the Coast Guard is treating this as a class-wide issue. COTF plans to verify correct installation through a visual inspection.	Pending

Source: GAO analysis of Coast Guard data. | GAO-16-314T

As we also found in January 2016, while the Coast Guard has plans to conduct FOT&E for the NSC, it will have accepted the delivery of at least the 6th NSC before the testing is complete, meaning that the Coast Guard will be operating 6 NSCs before it has resolved issues from IOT&E and knows the cutter's full capabilities. DHS's guidance for its major acquisitions does not require programs to conduct FOT&E, nor does it specify the timing of FOT&E or the actions that should be taken following the completion of testing.¹² Further, DHS's directive on test and evaluation does not include any direction or guidance on FOT&E.¹³

We concluded in our January 2016 report that this gap in DHS guidance also has implications for future DHS assets. Most significantly, the Coast Guard is in the process of designing the OPC, which is the last of the major cutter classes to be built as part of the recapitalization program. This cutter class, which is intended to bridge the mission gap between the FRC and NSC, is estimated to cost \$12.1 billion, making it the most expensive Coast Guard recapitalization program to date.¹⁴ Without updated guidance that establishes timeframes and responsibilities for completing all testing, the Coast Guard risks encountering the same scenario with the OPC—and other future DHS assets—that it has experienced with the NSC. That is, the Coast Guard could continue to buy assets without having demonstrated their full capabilities in testing. In January 2016 we recommended that updated guidance should establish factors that should be considered with planning FOT&E, including when test events will be concluded. We also recommended that an ARB be held, if necessary, to provide oversight and specify any further actions programs should take following FOT&E. DHS agreed with these recommendations and estimated they would be implemented by November 2016.

¹²Coast Guard acquisition guidance specifies that FOT&E is an objective of the Produce/Deploy Phase of the acquisition process, but does not specify when FOT&E is to conclude.

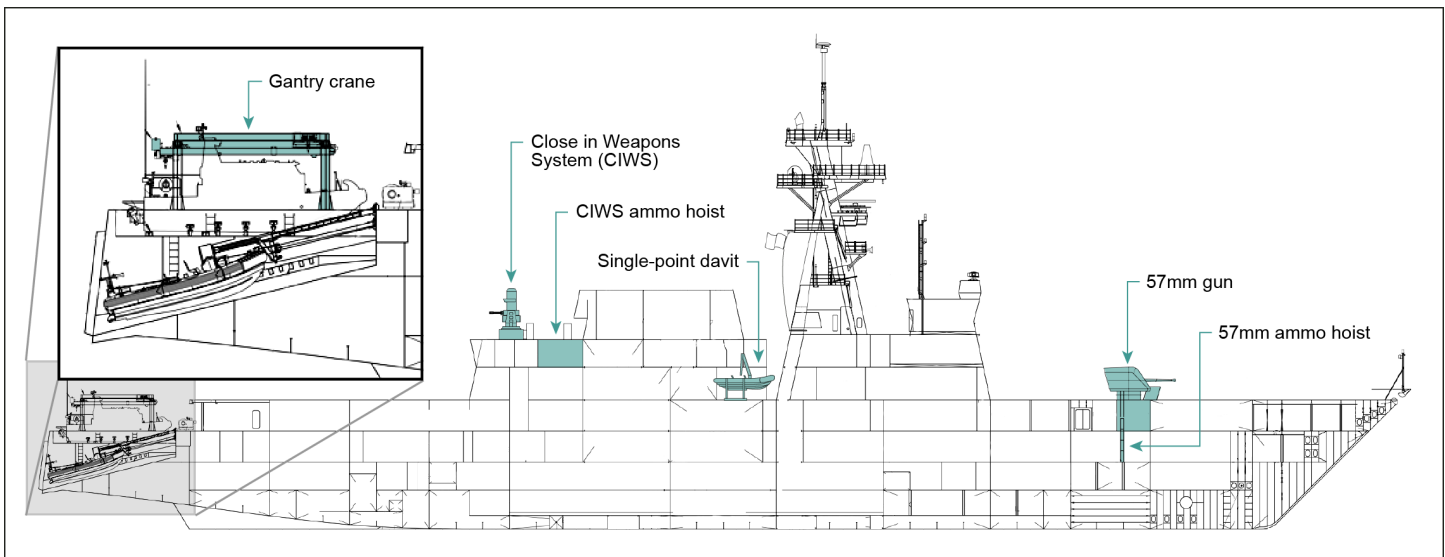
¹³DHS Directive 026-06, Test and Evaluation (May 22, 2009).

¹⁴The three classes of cutters are the 418' NSC, the 154' FRC (in production with 15 of 58 planned cutters delivered), and the OPC (in the design phase and planned for 25 cutters total).

Problems Discovered Outside of IOT&E Are Preventing the Coast Guard from Operating Fully Capable NSCs

As we reported in January 2016, by the time of the spring 2014 IOT&E event, the Coast Guard had nearly four years of experience operating the NSCs. The Coast Guard has encountered several issues that require major retrofits and design changes on the NSC to correct problems encountered during operations and discovered during test events outside of IOT&E. The total cost of changes we identified as of June 2015 totals approximately \$202 million. In order to minimize cost increases for some of these changes, the Coast Guard plans to maintain the original equipment design for the production of the remaining NSCs and plans to conduct retrofits after accepting delivery of the cutters. In some instances, replacement equipment is still in the prototype phase. The problems identified with these systems during operations will continue to impact the NSC until the design changes are implemented across the fleet. Figure 1 shows selected systems that will require retrofits after all eight cutters are built.

Figure 1: Selected National Security Cutter Systems Requiring Retrofitting After Production



Source: GAO presentation and analysis of U.S. Coast Guard data. | GAO-16-314T

Early testing can allow performance issues to be discovered at a point when fixes can be incorporated into the design of an asset while it is still in production. As we have previously found for Department of Defense programs, continuing with full-rate production before ensuring that assets meet key requirements risks replicating problems in each new asset until such problems are corrected. The Coast Guard conducted IOT&E several

years after it began operating the NSC and after the contracts for the majority of the fleet had been initiated. As a result, the Coast Guard plans to purchase and install equipment with known design flaws on the NSCs that are currently in production. Thus, the Coast Guard will be faced with paying for the replacement of these systems with new equipment that it must also purchase.

Furthermore, we found in January 2016 that the Coast Guard has encountered a variety of problems with the cutter's propulsion systems during operations and, although there are several factors known to influence these problems, the root causes and the method and cost of potential solutions are not yet known. The problems include: (1) high engine temperatures, which limit the top speed of the cutter in certain conditions, (2) cracked cylinder heads, which are occurring at a rate higher than expected and are the NSCs number one operational degrader and cost driver for maintenance, and (3) overheating generator bearings, which have caused at least one patrol to be cut short due to the lack of an effective backup generator. Although the Coast Guard has two studies underway to identify the root causes of these problems, until the causes are identified and corrective actions implemented, the Coast Guard is at risk of experiencing costly and potentially mission-limiting problems with this equipment across the fleet. Thus, we recommended, and DHS agreed, to provide oversight and specify any further actions the NSC program should take at the conclusion of the studies related to the propulsion systems.

Observations on the FRC and OPC Acquisitions

As the Coast Guard has progressed in its acquisition of cutters, it has matured its acquisition processes, which has been demonstrated in its approach with the FRC and OPC programs. The process to date reflects some lessons learned from the NSC acquisition, for example in the areas of competition and the schedule for IOT&E. Furthermore, as the \$12 billion OPC program moves forward, it may have opportunities to further incorporate some best practices that we have highlighted in our past work on shipbuilding.¹⁵

As we reported in June 2014 and April 2015, the Coast Guard purchased the technical specifications and licenses necessary to build the FRC in

¹⁵ [GAO-09-322](#) and [GAO-15-171SP](#).

order to use the information to conduct a full and open competition for the remaining 26 of 58 planned vessels.¹⁶ According to Coast Guard officials, the second phase of the acquisition was intended to promote competition and allowed bidders on the contract to make certain design changes to the ship, though the key performance parameters remain the same and the design for several critical systems—such as the propulsion system, generators, hull structure, and bridge layout—remain the same. The Coast Guard plans to award a contract for the second phase of this acquisition by the end of June 2016. We noted in June 2014 that when the government owns technical data rights, it does not need to rely on only one contractor to meet requirements.

As we also reported in April 2015, the Coast Guard is using a two-phased, competitive strategy to select a contractor to construct the OPC.¹⁷ In general, as we have previously found, competition is likely to save taxpayer dollars as opposed to a sole source acquisition approach, such as was used for the NSC.¹⁸ During the first phase for the OPC, the Coast Guard conducted a full and open competition to select three contractors to perform preliminary and contract design work, and, in February 2014, awarded firm-fixed price contracts to three shipbuilders. For the second phase, the Coast Guard plans to award, by the end of fiscal year 2016, a contract to one of these shipbuilders to complete the detailed design of the vessel and construct the first 9 to 11 ships. As we also reported, the Coast Guard plans to recompile the contract for the remaining vessels.

Competitive contracts can allow for the best return on investment for taxpayers by saving taxpayer money, conserving scarce resources, improving contractor performance, curbing fraud, and promoting accountability for results.¹⁹ According to Coast Guard officials, the Coast Guard currently plans to award the construction contract for the lead OPC ship in fiscal year 2018 and deliver this ship in 2021. As we found in April 2015, the OPC's initial and full operational capability dates both slipped 15 months, which the Coast Guard attributes to procurement delays,

¹⁶GAO-14-450 and GAO-15-171SP.

¹⁷GAO-15-171SP.

¹⁸GAO, *Defense Contracting: Actions Needed to Increase Competition*, GAO-13-325 (Washington, D.C.: Mar. 28, 2013).

¹⁹GAO-13-325.

including a bid protest that GAO ultimately denied in June 2014. The Coast Guard's fiscal year 2016 Capital Investment Plan reflects \$1.5 billion in funding for the OPC, which funds the detailed design work and construction of the first three vessels. After the first 3 of the planned fleet of 25 OPCs are built, the Coast Guard plans to increase its purchase to 2 OPCs per year until the final asset is delivered, currently scheduled for fiscal year 2035.

Regarding the timeframes for IOT&E, as we reported in January 2016, this event occurred for the NSC after 3 of its 8 planned cutters were operational. For the FRC, IOT&E occurred after 4 of the planned 58 cutters were operational. For the OPC, the Coast Guard plans to begin IOT&E by December 2023, by which time it expects to have 1 operational OPC of a planned buy of 25.

In addition to its efforts to enhance competition, the Coast Guard has developed a warranty provision under its contract with Bollinger Shipyards for the FRC program that has held the contractor responsible for production deficiencies. As we reported in June 2014, the Coast Guard does not always have insight into how much it costs the contractors to fix these issues.²⁰ However, after multiple deficiencies interrupted production, officials noted they are confident that the Coast Guard has received value from this warranty. The Coast Guard plans to use these strategies when purchasing the OPC.²¹

Based on best practices that we have previously identified, the Coast Guard may have opportunities to incorporate additional shipbuilding best practices with the OPC program. In May 2009, we reported on best practices that commercial shipbuilders use to ensure that ships are delivered on time and within budget.²² We found that before a contract is signed, a full understanding of the effort needed to design and construct the ship is reached, enabling commercial buyers and shipbuilders to sign a contract that fixes the price, delivery date, and ship performance parameters. To minimize risk, buyers and shipbuilders reuse previous designs to the extent possible and attain an in-depth understanding of

²⁰[GAO-14-450](#).

²¹We are currently reviewing Coast Guard and Navy warranties and guarantees for shipbuilding and plan to issue our report this spring.

²²[GAO-09-322](#).

new technologies included in the ship design. Before construction begins, commercial shipbuilders complete key design phases that correspond with the completion of a three-dimensional product model. Final information on the systems that will be installed on the ship is needed to allow design work to proceed. During construction, buyers maintain a presence in the shipyard and with key suppliers to ensure the ship meets quality expectations and is delivered on schedule. We will continue to assess the progress of the FRC and OPC acquisitions going forward.²³

Chairman Hunter, Ranking Member Garamendi, and Members of the Subcommittee, this concludes my prepared statement. I would be pleased to respond to any questions.

GAO Contact and Staff Acknowledgments

If you or your staff have any questions about this statement, please contact Michele Mackin at (202) 512-4841 or mackinm@gao.gov. In addition, contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. Individuals who made key contributions to this testimony include Katherine Trimble, Assistant Director; John Crawford; Lindsey Cross; and Peter W. Anderson.

²³The DHS Appropriations Act, 2015 requires GAO to develop a plan for ongoing reviews of these programs. Explanatory Statement submitted by Mr. Rogers of Kentucky, Chairman of the House Committee on Appropriations, regarding H.R. 240, Department of Homeland Security Appropriations Act, 2015 (published in Cong. Record, Jan. 13, 2015, at p. H276).

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